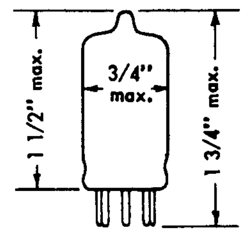
RELIABLE PENTODE

TYPE CK5654/6AK5W/6096

The CK5654/6AK5W/6096 is a heater-cathode type, sharp cutoff, RF pentode of miniature construction for use in low power applications at high and ultra-high frequencies. It is designed for dependable operation under conditions of shock vibration usually found in mobile and aircraft applications.



MECHANICAL DATA

ENVELOPE: T-5½ Glass

BASE: Miniature Button 7-Pin

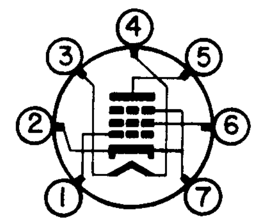
TERMINAL CONNECTIONS:

- Pin 1 Grid #1
- Pin 2 Cathode, Grid #3
- Pin 3 Heater
- Pin 4 Heater
- Pin 5 Plate
- Pin 6 Grid #2
- Pin 7 Cathode, Grid #3

MECHANICAL RATINGS:

Maximum Impact Acceleration (Shock Test-Note 3)	450 G
Maximum Vibrational Acceleration (96 Hour Fatigue Test-Note 4)	2.5 G
Maximum Bulb Temperature	165 °C

MOUNTING POSITION: Any



BOTTOM VIEW

ELECTRICAL DATA

CAUTION-To Electronic Equipment Design Engineers: Special attention should be given to the temperature at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if absolute maximum ratings are exceeded. Both reliability and performance will be jeopardized if filament voltage ratings are exceeded. Life and reliability of performance are directly related to the degree that regulation of the heater voltage is maintained at its centered rated value.

RATINGS AND NORMAL OPERATION:	MIL-E-1B SYMBOL	ABSOLUTE MINIMUM	NORMAL TEST CONDITIONS (Note 6)	NORMAL OPERATION (Note 5)		ABSOLUTE MAXIMUM	MIL-E-1B UNITS
Heater Voltage (Note 7):	Ef:	5.7	6.3	6.3	6.3	6.9	V
Plate Voltage:	Eb:		120	120	150	200	Vdc
Grid #1 Voltage:	Ec1:		-2.0	0	0		Vdc
Grid #2 Voltage:	Ec2:		120	120	140	155	Vdc
Plate Dissipation:	Pp:			0.9	1.05	1.65	W
Grid #2 Dissipation:	Pg2:			0.3	0.31	0.55	W
Heater-Cathode Voltage:	Ehk:	-130				+130	Vdc
Cathode Current (Note 9)	Ik:			10.0	9.2	20	mAdc
Cathode Resistance:	Rk:			200	330		ohms

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)

TEST	CONDITIONS	AQL %	MIL-E-1B SYMBOL	MIN.	LAL.	BOGIE	UAL.	MAX.	ALD.	MIL-E-1B UNITS
ACCEPTANCE TEST-GROUP C										
Continuity and Short:		0.4								
ACCEPTANCE TESTS-GROUP D		**COMBINED AQL=1.0%**								
Heater Current:		0.65	If:	160		175		190		mA
Heater-Cathode Leakage	Ehk=100 Vdc, Heater Positive	0.65	Ihk:					10		µAdc
	Ehk= 100 Vdc, Heater Negative		Ihk:					10		µAdc

Tentative Data

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd)

TEST	CONDITIONS	AQL %	MIL-E-1B SYMBOL	MIN.	LAL.	BOGIE	UAL.	MAX.	ALD.	MIL-E-1B UNITS
Grid Current (1):	Rg1=0.1 Meg.	0.65	Ic1(1):					-0.1		μAdc
Plate Current (1):		0.65	Ib(1):	5.0	6.5	7.5	8.5	11.0	2.5	mAdc
Screen Current:		0.65	Ic2:	0.8	1.8	2.5	3.2	4.0	1.5	mAdc
Transconductance (1):		0.65	Sm(1):	4000	4525	5000	5475	6250	1025	μmhos
ACCEPTANCE TESTS-GROUP E										
Insulation of Electrodes:	EF=6.3V E(g1-all)= 100 Vdc; g1 Negative	2.5	R(g1-all):	100						meg.
	E(g2-all)=300 Vdc; g2 Negative		R(g2-all):	100						meg.
	E(p-all)=300 Vdc P Negative		R(p-all):	100						meg.
Plate Current (2):	Ec1=-10 Vdc	2.5	Ib(2):					200		μAdc
Plate Current (3):	Ec1=-5.5 Vdc	2.5	Ib (3):	5.0						μAdc
Transconductance (2):	Ef=5.7V; (Note 8)	2.5	ΔSm:					15		%
Grid Current (2):	Eb=150Vdc; Ec2=125 Vdc; Ec1=0; Ef=7.0Vac; RK=130 ohms; Rg1=0.1 Meg; after 5 min. at Ef=7.0Vac; measure grid current at Ef=7.0Vac; 3 min. test not permitted.	2.5	Ic1(2):	0				-0.5		μAdc
RF Noise:	Ec1=0; E cal=15.0m-Vac; RK=200 ohms; CK=0.2 uf	2.5						3.0		mW
Noise and Microphonics:	Ef=6.3 Vac; Ebb=Ecc2=200 Vdc; Ec1=0; Rk=1000 ohms; Rp=0.1 meg.; Rg2=0.5 Meg.; Cg2=2 uf. Ehk=0; CK= 1000μf.	2.5	Ep:					100		mVac
ACCEPTANCE TESTS-GROUP A										
Shock:	Hammer Angle=30° (Note 3)									
Fatigue:	96 Hours: (Note 4)	6.5								
Post shock and Fatigue Test end Points:										
Vibration (2):	F=25 cps; G=2.5; Rp=10,000 ohms		Ep(2):					450		mVac
Heater-Cathode Leakage (1):	Ehk=+100 Vdc:		Ihk(1):					30		μAdc
Heater-Cathode Leakage (2):	Ehk=-100 Vdc		Ihk(2):					30		μAdc
Transconductance (1):			Sm(1):	3500						μmhos
Grid Current (1):			Ic1(1):	0				-0.2		μAdc
ACCEPTANCE TEST-GROUP F										
Vibration (2):	F=25 cps; G=2.5; Rp=10,000 ohms	6.5	Ep:					150		mVac
Capacitance:	(Note 2)		Cg1P:					0.020		uuf
Capacitance:	(Note 2)	6.5	Cin:	3.40				4.6		uuf
Capacitance:	(Note 2)		Cout:	2.45				3.25		uuf
Low Pressure Voltage Breakdown:		6.5		500						Vac

RELIABLE PENTODE

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd)

TEST	CONDITIONS	AQL %	MIL-E-1B SYMBOL	MIN.	LAL.	BOGIE	UAL.	MAX.	ALD	MIL-E-1B UNITS
ACCEPTANCE TEST - GROUP B										
Glass Strain:		2.5								
ACCEPTANCE LIFE TEST										
Heater Cycling:	Ef=7.5 V; Ehk=+135 Vdc; Ec1=Eb=Ec2=0			2000						cycles
Heater Cycling Life Test End Points:										
Heater-Cathode Leakage (1):	Ehk=+100 Vdc		Ihk(1):					20		μAdc
Heater Cathode Leakage (2):	Ehk=-100 Vdc		Ihk(2):					20		μAdc
1 Hour Stability Life Test:	TA=Room; Ehk=+135 Vdc; Eb=150 Vdc; Ec1=0; Ec2=125 Vdc; Rg1=0.1 Meg.; Rk=130 ohms									
1 Hour Stability Life Test End Points:										
Transconductance (1): Change of individual tube from initial:	(typical sample size=50 tubes)	1.0	△Sm(1):					10		%
100 Hour Survival Rate Life Test:	TA=Room; Ehk=+135 Vdc; Eb=150 Vdc; Ec1=0; Ec2=125 Vdc; Rg1=0.1 Meg; Rk=130 ohms									
100 Hour Survival Rate Life Test End Points:										
Inoperatives:	(Typical sample size=200 tubes)	0.65								
500 and 1000 Hour Intermittent High Temperature Life Test:	T-Bulb=165° C; Ehk=+135 Vdc Eb=150 Vdc; Ec1=0; Ec2=125 Vdc Rg1=0.1 Meg; Rk=130 ohms									

TEST	CONDITIONS	MIL-E-1B SYMBOL	MIN.	MAX.	MIL-E-1B UNITS	MAX. DEFECTS PER CHARACTERISTIC 1st Sample	MAX. DEFECTS PER CHARACTERISTIC Combined Sample
500 Hour Intermittent High Temperature Life Test End Points:	(Typical sample size=20 tubes 1st sample, 40 tubes 2nd sample (Total allowable combined defects=4 tubes 1st sample, 8 tubes 1st and 2nd samples)						
Inoperatives:						1	3
Heater Current:		If;	160	190	mA	1	3
Heater-Cathode Leakage		Ihk:		10	μAdc	1	3
Grid Current (1):		Ic1(1):		-0.1	μAdc	1	3
Transconductance (1):		Sm(1):	3750	6250	μmhos	1	3
Transconductance (1) Average Change (Note 10):		ave. △ Sm(1):		15	%		

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd)

TEST	CONDITIONS	MIL-E-1B SYMBOL	MIN.	MAX.	MIL-E-1B UNITS	MAX. DEFECTS PER CHARACTERISTIC 1st Sample	Combined Sample
Plate Current (1):		Ib(1):	4.5	11.0	mAdc	2	5
Electrode Insulation:							
(g1-all)		Rg1-all:	50		meg.		
(g2-all)		Rg2-all:	50		meg.	2	5
(P-all)		Rp-all:	50		meg.		
Transconductance (2) (Note 8)		ΔSm(2):		15	%	2	5
1000 Hour Intermittent High Temperature Life Test End Points:	(Typical sample size=20 tubes 1st sample, 40 tubes 2nd sample)						
Inoperatives						2	5
Heater Current:		If:	160	190	mA	2	5
Heater-Cathode Leakage:		Ihk:		10	μAdc	2	5
Grid Current (1):		Ic1(1):		-0.1	μAdc	2	5
Transconductance (1):		Sm(1):	3500	6250	μmhos	2	5
Plate Current (1):		Ib(1):	4.0	11.0	mAdc	4	8

NOTES:

Note 1 Characteristics, Quality Control Test Procedures, and Inspection Levels are made according to the appropriate paragraphs of MIL-E-1B "Inspection Instructions for Electron Tubes" and MIL-STD-105A.

Note 2 With Shield #316 connected to cathode.

Note 3 Test Conditions and Acceptance criteria per Shock Test procedures of MIL-E-1B basic specification.

Note 4 Test Conditions and Acceptance criteria per Fatigue Test procedures of MIL-E-1B basic specification.

Note 5 These normal values represent conditions at which control reliability may be expected.

Note 6 These normal test conditions are used for all characteristics unless otherwise stated under the individual test item.

Note 7 For most applications the performance will not be adversely affected by ± 10% heater voltage variation, but when the application can provide a closer control of heater voltage, an improvement in reliability will be realized.

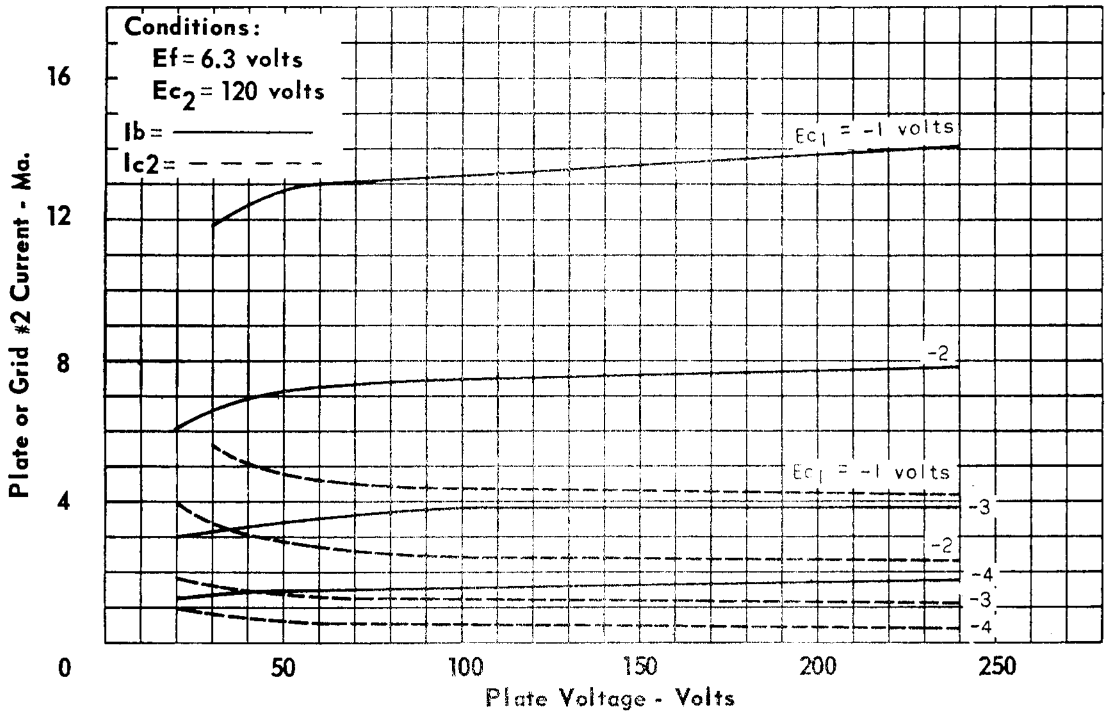
Note 8 Change of transconductance for individual tubes from that value measured at Ef=6.3V to that value measured at Ef=5.7V.

Note 9 Difficulty may be encountered if this tube is operated for long periods of time with very small values of cathode current.

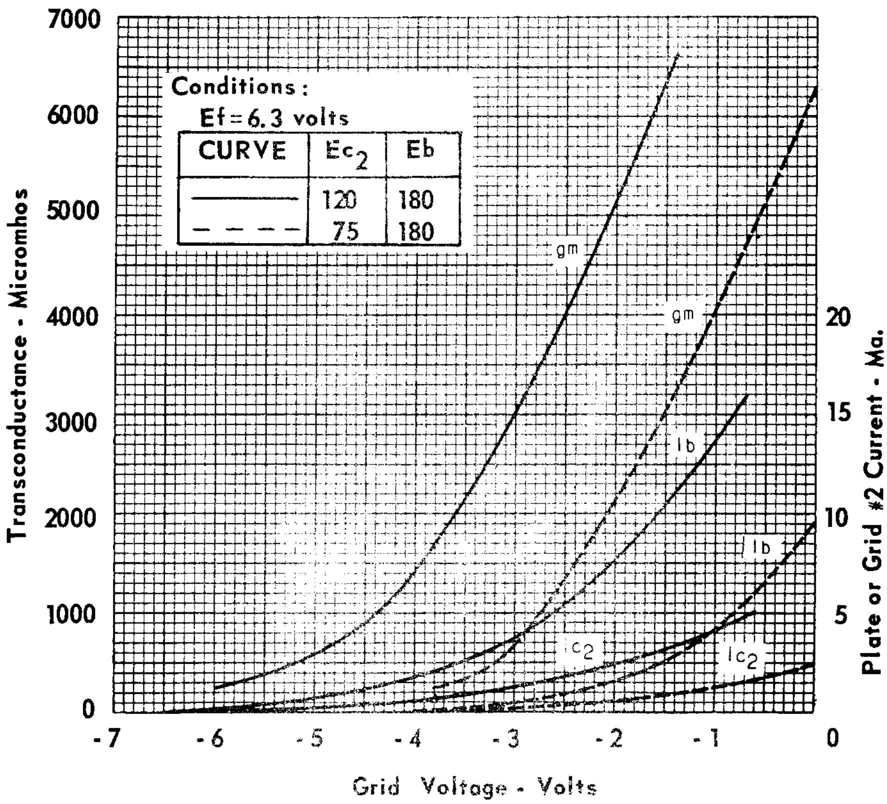
Note 10 The average percentage change shall be ascertained from the determination of the individual changes for each tube (inoperatives excluded) from the zero hour value for the referenced characteristic.

RELIABLE PENTODE

AVERAGE PLATE CHARACTERISTICS



AVERAGE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS
(Triode Connected)

